CLAIMS

1. A power back-off method to mitigate the effects of FEXT noise in a communication system comprising at least one transmitter k, the transmitter k transmitting to a central site via a corresponding channel, the method comprising:

determining a transmit power spectral density for the transmitter k, $S(f,l_k)$, according to:

$$S(f,l_k) = \left(\frac{l_k}{l_R}\right)^{\upsilon} \frac{S(f,l_R)\cdot|H(f,l_R)|^2}{|H(f,l_k)|^2} \quad \text{for } l_k \le l_R$$

wherein l_k is a channel length of the channel corresponding to the transmitter k, $H(f,l_k)$ is a channel transfer function of the channel corresponding to the transmitter k, l_R is a reference channel length, $H(f,l_R)$ is a reference channel transfer function, $S(f,l_R)$ is a reference transmit power spectral density, and $\upsilon \neq -1 \textit{ or } 0$; and

controlling transmitter k to transmit at the transmit power spectral density $S(f,l_k)$.

2. A power back-off method, as per claim 1, wherein υ is set close to one to provide substantially equalized data rates for channels of the communication system.

3. A power back-off method, as per claim 2, wherein υ is set to approximately 0.95.

4. A power back-off method, as per claim 1, wherein said communication system is a VDSL system.

5. A communication system comprising:

at least one transmitter k, the transmitter transmitting to the central site with a transmit power spectral density $S(f,l_k)$ via a corresponding channel, wherein the channel has a length l_k and a channel transfer function $H(f,l_k)$; and

wherein the transmit power spectral density $S(f,lk)$ is governed according to:

$$S(f,l_k)=\left(\frac{l_k}{l_R}\right)^{\upsilon}\frac{S(f,l_R)\cdot\left|H(f,l_R)\right|^2}{\left|H(f,l_k)\right|^2}\quad\text{for }\ l_k\le l_R$$

where l_R is a reference channel length, $H(f,l_R)$ is a reference channel transfer function, $S(f,l_R)$ is a reference transmit power spectral density, and $\upsilon \neq -1\ or\ 0$.

6. A communication system, as per claim 5, wherein υ is set close to one to provide substantially equalized data rates for channels of the communication system.

7. A communication system, as per claim 6, wherein υ is set to approximately 0.95.

8. A communication system, as per claim 5, wherein said communication system is a VDSL system.

9. A transmitter that transmits on a channel with a transmit power spectral density $S(f,l_k)$ according to:

$$S(f,l_k)=\left(\frac{l_k}{l_R}\right)^{\upsilon}\frac{S(f,l_R)\cdot\left|H(f,l_R)\right|^2}{\left|H(f,l_k)\right|^2}\quad\text{for }\ l_k\le l_R$$

wherein l_k is a channel length of the channel, $H(f,l_k)$ is a channel transfer function of the channel, $S(f,l_R)$ is a reference transmit power spectral density, l_R is a reference channel length, $H(f,l_R)$ is a reference channel transfer function, and $\upsilon \neq -1 \ or \ 0$.

10. A transmitter that transmits on a channel with a transmit power spectral density, as per claim 9, wherein υ is set close to one to provide substantially equalized data rates.

11. A transmitter that transmits on a channel with a transmit power spectral density, as per claim 10, wherein υ is set to approximately 0.95.

12. A transmitter that transmits on a channel with a transmit power spectral density, as per claim 9, wherein the transmitter and the channel are part of a VDSL system.

13. A transmitter that transmits on a channel in a communication system, wherein the transmitter transmits with a transmit power spectral density that is controlled to provide substantially equal data rates for each channel in the communication system.

14. A transmitter that transmits on a channel in a communication system, as per claim 13, wherein the transmitter transmits with a transmit power spectral density $S(f,l_k)$ according to:

$$S(f,l_k) = \left(\frac{l_k}{l_R}\right)^{\upsilon} \frac{S(f,l_R)\cdot|H(f,l_R)|^2}{|H(f,l_k)|^2} \quad \text{for } l_k \leq l_R$$

wherein l_k is a channel length of the channel that the transmitter transmits on, $H(f,l_k)$ is a channel transfer function of the channel that the transmitter transmits on, $S(f,l_R)$ is a reference transmit power spectral density, l_R is a reference channel length, $H(f,l_R)$ is a reference channel transfer function, and υ is close to one.

15. A transmitter that transmits on a channel in a communication system, as per claim 14, wherein υ is set to approximately 0.95.

16. A transmitter that transmits on a channel in a communication system, as per claim 13, wherein the transmitter and the channel are part of a VDSL system.

17. A power back-off method to mitigate the effects of FEXT noise in a communication system comprising at least one transmitter k, the transmitter k transmitting to a central site via a corresponding channel, the method comprising:

determining the transmit power spectral density for the transmitter k, $S(f,l_k)$, according to:

$$S(f,l_k) = G \cdot \left(\frac{l_k}{l_R} \right)^{\upsilon} \frac{S(f,l_R) \cdot |H(f,l_R)|^2}{|H(f,l_k)|^2} \qquad \text{for } l_k \le l_R$$

wherein l_k is a channel length of the channel corresponding to the transmitter k, $H(f,l_k)$ is a channel transfer function of the channel corresponding to the transmitter k, l_R is a reference channel length, $H(f,l_R)$ is a reference channel transfer function, $S(f,l_R)$ is a

reference transmit power spectral density, and G has a value that depends on the channel length l_k such that two or more data rate service areas are defined; and

controlling transmitter k to transmit at the transmit power spectral density $S(f,l_k)$.

18. A power back-off method, as per claim 17, wherein G>1 for channel length l_k less than a length l_{R1} that delineates a first data rate service area and G=1 for channel length l_k greater than the length l_{R1} so as to define a second data rate service area.

19. A power back-off method, as per claim 17, wherein υ is set close to one to provide substantially equalized data rates for channels of the communication system.

20. A power back-off method, as per claim 19, wherein υ is set to approximately 0.95.

21. A power back-off method, as per claim 17, wherein said communication system is a VDSL system.

22. A communication system comprising:

at least one transmitter k, the transmitter transmitting to the central site with a transmit power spectral density $S(f,l_k)$ via a corresponding channel, wherein the channel has a length l_k and a reference channel transfer function $H(f,l_k)$; and

wherein the transmit power spectral density $S(f,lk)$ is governed according to:

$$S(f,l_k) = G \cdot \left(\frac{l_k}{l_R}\right)^{\upsilon} \frac{S(f,l_R) \cdot |H(f,l_R)|^2}{|H(f,l_k)|^2} \qquad \text{for } l_k \le l_R$$

where l_R is a reference channel length, $H(f,l_R)$ is a reference channel transfer function, $S(f,l_R)$ is a reference transmit power spectral density , and G has a value that depends on the channel length l_k such that two or more data rate service areas are defined.

23. A communication system, as per claim 22, wherein G>1 for channel length l_k less than a length l_{R1} that delineates a first data rate service area and G=1 for channel length l_k greater than the length l_{R1} so as to define a second data rate service area.

24. A communication system, as per claim 22, wherein υ is set close to one to provide substantially equalized data rates for channels of the communication system.

25. A communication system, as per claim 24, wherein υ is set to approximately 0.95.

26. A communication system, as per claim 22, wherein said communication system is a VDSL system.

27. A transmitter that transmits on a channel in a communication system, wherein the transmitter transmits with a transmit power spectral density $S(f,l_k)$ according to:

$$S(f,l_k) = G \cdot \left(\frac{l_k}{l_R} \right)^{\upsilon} \frac{S(f,l_R) \cdot |H(f,l_R)|^2}{|H(f,l_k)|^2} \qquad \text{for } l_k \le l_R$$

wherein l_k is a channel length of the channel that the transmitter transmits on, $H(f,l_k)$ is a channel transfer function of the channel that the transmitter transmits on, $S(f,l_R)$ is a reference transmit power spectral density, l_R is a reference channel length, $H(f,l_R)$ is a reference channel

transfer function, and G has a value that depends on the channel length l_k such that two or more data rate service areas are defined.

28. A transmitter that transmits on a channel in a communication system, as per claim 27, wherein G>1 for channel length l_k less than a length l_{R1} that delineates a first data rate service area and G=1 for channel length l_k greater than the length l_{R1} so as to define a second data rate service area.

29. A transmitter that transmits on a channel in a communication system, as per claim 27, wherein υ is set close to one to provide substantially equalized data rates for channels of the communication system.

30. A transmitter that transmits on a channel in a communication system, as per claim 29, wherein υ is set to approximately 0.95.

31. A transmitter that transmits on a channel in a communication system, as per claim 27, wherein said communication system is a VDSL system.